(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 112 397**
A1

(12) EUROPEAN PATENT APPLICATION

(21) Application number: **82111721.5**

(22) Date of filing: **17.12.82**

(51) Int. Cl.³: **F 21 M 7/00**, F 21 M 3/08

(43) Date of publication of application: **04.07.84**
Bulletin 84/27

(84) Designated Contracting States: **DE FR GB NL**

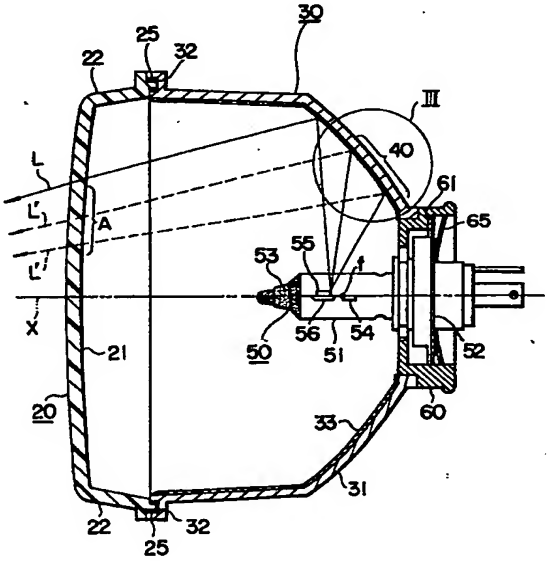
(71) Applicant: **ICHIKOH INDUSTRIES LIMITED, 10-18, Higashigotanda 5-chome, Shinagawa-ku Tokyo (JP)**

(72) Inventor: **Maekawa, Masashi, 1198 Hase Atsugi-shi, Kanagawa-ken (JP)**
Inventor: **Hasegawa, Tatsumi, 934-3 Horinishi Hatano-shi, Kanagawa-ken (JP)**

(74) Representative: **Patentanwälte Grünecker, Dr. Kinkeldey, Dr. Stockmair, Dr. Schumann, Jakob, Dr. Bezold, Meister, Hilgers, Dr. Meyer-Plath, Maximilianstrasse 58, D-8000 München 22 (DE)**

(54) Vehicle headlamp.

(57) A vehicle headlamp comprises a reflector (30) having about a reflecting parabolic face (33), and a lens (20) made of synthetic resin and attached to the front end of said reflector (30). The vehicle headlamp further includes a lamp (50) held by said reflector, at least one filament (55) in said lamp positioned ahead the focussing point (f) of said reflector, and a zone (40) formed on the reflecting face where a mean is arranged to reduce the amount of light coming from the filament onto the lens at an upper area (A) thereof, said zone being positioned above the lamp and along a axis vertically passing through an optical axis (X). Said light reducing means is intended to reflect light either irregularly or diffusedly. The irregularly reflecting means comprises using no undercoat which serves to make the reflecting coat flat and smooth, or making the reflector body rough and uneven and then applying reflecting coat onto this rough and uneven portion with the undercoat interposed therebetween. The diffusedly reflecting means comprises forming slanted faces on the inner face of said reflector body and applying the reflecting coat onto these slanted faces with the undercoat interposed therebetween.



EP 0 112 397 A1

SPECIFICATION

1. Title of the invention

Vehicle headlamp

2. Background of the invention

The present invention relates to a vehicle headlamp and, more particularly, a vehicle headlamp having a front lens particularly made of synthetic resin.

The conventional front lens used to the vehicle headlamp is made by press-molding a mass of molten glass, but a front lens made of synthetic resin has been developed because it can be light-weighted and because a plurality of prisms can be easily ~~provided~~ formed thereon to control the light ~~of~~ from a filament.

In the case of the headlamp in which the front lens made of synthetic resin is employed, however, light reflected by a reflector is focussed to soften the front lens at an upper area thereof under high temperature atmosphere or high terminal voltage, when filament# for the lamp are positioned ahead the focussing point of said reflector. This will be described in more detail referring to the conventional headlamp shown in Figs. 1 and 2, in which Fig. 1 is a front view showing the conventional headlamp and Fig. 2 is a sectional view taken along the line I - I in Fig. 1.

As shown in Fig. 2, a synthetic resin lens 1 is attached to the front end of a reflector 2. The reflector 2 has a reflecting surface 3 which is made substantially parabolic, and to the reflecting surface 3 is fixed a lamp holder 4 for attaching a lamp 6 to the reflector 2. The lamp 6 attached to the lamp holder 4 by means of a set spring 5 includes a main filament 8, a sub-filament 9 and a light

shielding cap 10 in a glass envelope 7, said light shielding cap 10, serving to cover about the lower half of said sub-filament 9. The main filament 8 is positioned ~~substantially at~~ nealy corresponding to the focussing point (f) of said reflector 2 while the sub-filament 9 is positioned ahead the focussing point (f). Numeral 11 represents a light shielding ~~film~~ coat applied to the front end of the glass envelope 7.

Light radiated from the main filament 8 is reflected by the reflecting surface 3 to be substantially parallel to an optical axis (X) or to be rather diffused. On the contrary, light (L) ~~of~~ radiated from the sub-filament 9 is reflected by the reflecting surface 3 to be focussed. This is because the sub-filament 9 is positioned ahead the focussing point (f).

~~Cars~~ Vehicles are used under various circumstances like on hot desert, for example. The headlamp attached to the ~~car~~ vehicle which runs on this desert area is under high temperature atmosphere. It is therefore necessary to test the headlamp to see if the headlamp can be used under high temperature atmosphere or at 80°C, for example. When the headlamp ~~arranged~~ exposed as described above is left turned on under atmosphere of 80°C, atmosphere inside the headlamp is caused hot due to atmosphere around the headlamp, heat caused by focussing operation and the lamp 6 itself when turned on, and stayed inside the headlamp particularly at the upper portion thereof. As the result, heat is concentrated onto an area (A) at the upper portion of the lens 1 as shown in Fig. 1, so that the lens 1 is softened at the area (~~a~~ A) thereof.

This softening is caused even under normal temperature but when teminal voltage becomes high. When terminal

voltage becomes high, light radiated from the sub-filament 9 becomes intense, making heat high. Therefore, reflected light (L) including even high heat is combined with atmosphere inside the headlamp to thereby soften the area (A).

3. Summary of the invention

An object of the present invention is to reduce the amount of reflected light incident onto a synthetic resin lens at an upper area thereof and to prevent heat from being concentrated onto said area.

Another object of the present invention is to provide a simple construction for preventing heat from being concentrated onto the upper area of said synthetic resin lens.

These and other objects as well as features of the present invention will become apparent from the following detailed description with reference to the accompanying drawings.

4. Brief description of the drawings

Figs. 1 and 2 show the conventional vehicle headlamp, in which Fig. 1 is a front view thereof and Fig. 2 is a sectional view taken along the line I - I in Fig. 1.

Fig. 3 is a front view, partly broken, showing an embodiment of the present invention.

Fig. 4 is a sectional view taken along the line II - II in Fig. 3.

Fig. 5 is an enlarged view showing the portion III in Fig. 4.

Fig. 6 shows another embodiment of the present invention, in which a portion corresponding to the portion III in Fig. 4 is shown enlarged.

Fig. 7 is a front view, partly broken, showing a further embodiment of the present invention.

Fig. 8 is a sectional view taken along the line IV - IV in Fig. 7.

Fig. 9 is an enlarged view showing the portion V in Fig. 8.

Fig. 10 is a front view, partly broken, showing a variation of the embodiment shown in Fig. 7.

Fig. 11 is a sectional view taken along the line VI - VI in Fig. 10 and showing a main portion enlarged.

5. Detailed description of the preferred embodiments

As shown in Fig. 3, a vehicle headlamp according to the present invention is of rectangular shape and includes a lens 20 attached to the front end of a reflector 30, as shown in Fig. 4. The lens 20 is made of transparent synthetic resin such as polycarbonate, for example, and comprises a lens face 21 formed on the inner surface thereof and having a plurality of prisms to control light, and a side wall 22 enclosing the lens face 21. The side wall 22 is air-tightly attached to the opened end face of the reflector 30 by means of a bonding agent 25 which is previously filled in a groove 32 formed on the opened front end face of said reflector 30.

The reflector 30 has about a parabolic reflecting surface 33 inside. The reflecting surface 33 has an attachment hole, in which is fixed a lamp holder 60 for attaching a lamp 50 thereto. The reflector 30 may be formed integrally ~~integral~~ with the lamp holder 60.

The lamp holder 60 is formed cylindrical so as to enable a glass envelope 51 for the lamp 50 to be inserted

therethrough. The lamp holder 60 has a stepped portion 61 inside, on which a flange 52 of the lamp 50 is rested. The lamp 50 is attached to the lamp holder 60 in such a way that the flange 52 is urged against the stepped portion 61 by means of a set spring 65.

The lamp 50 includes a main filament 54, a sub-filament 55, and a light shielding cap 56 inside the glass envelope 51, to the front end of which is applied a light shielding ~~film~~ coat 53, said light shielding cap 56 covering substantially the lower half of the sub-filament 55. The sub-filament 55 is positioned ahead the main filament 54 in the glass envelope 51. Halogen H_4 lamp according to ECE regulation may be employed as the lamp 50. The lamp 50 is attached to the lamp holder 60 in such a way that the sub-filament 55 is positioned ahead the focussing point (f) of the reflector 30 and that the main filament 54 is positioned substantially at the focussing point (f). Therefore, light radiated from the main filament 54 is reflected by the reflecting parabolic face 33 to be substantially parallel to an optical axis (X) or to be rather diffused. On the contrary, light (L) radiated from the sub-filament 55 is reflected by the reflecting face 33 to become focussed, as shown in Fig. 4. In the case of this embodiment, the sub-filament 55 is positioned ahead the focussing point (f) but with its center line located on the optical axis (X), while the main filament 54 is positioned to become contacted with the optical axis (X) and the focussing point (f) but with its center line located below the optical axis (X). The main filament 54 is used as upper beam and the sub-filament 55 is used as dipped beam.

Fig. 5 is an enlarged view showing a portion III in Fig. 4. The reflecting parabolic face 33 comprises applying an undercoat 34 to the inner face of a parabolic reflector body 31, vacuum-vaporing a reflecting ~~film~~ coat 35 such as aluminium, for example, to the undercoat 34, and applying a transparent top coat 36 to the reflecting film 35, said transparent top coat 36 serving to protect the reflecting ~~film~~ coat 35. The undercoat 34 is about 10 - 15μ thick and the reflecting ~~film~~ coat 35 about 0.05μ thick in this embodiment. The reflector body 31 is made of metal or of synthetic resin such as polybuthylene terephthalate, for example.

At the reflecting parabolic face 33 thus arranged is formed a zone 40 where a light reducing means is provided to reduce the amount of light coming from the sub-filament 55 onto the upper area (A) of the lens face 21. The position of said zone 40 is above the lamp 50 and along an axis (Y) vertically passing through the optical axis (X). The light reducing means arranged at the zone 40 is intended to irregularly reflecting light, as shown in Fig. 5. This ~~ir-~~ regularly reflecting means comprises making the zone 40 undercoatless 41. When the reflector body 31 is made of metal or synthetic resin, its surface is made or molded slightly rough and uneven. This slightly rough and uneven surface of said reflector body 31 is therefore covered by the undercoat 34 to give no influence to the reflecting ~~film~~ coat 35. Light (L) reflected by the reflecting parabolic face 33 is thus reflected in the predetermined direction. When the zone 40 is made undercoatless 41, however, the rough surface of said reflector body 31 is followed by the reflecting ~~film~~ coat 35 to thereby

reflect light irregularly. Light (L') reflected by the undercoatless zone 40 is thus reduced in absolute magnitude when incident onto the area (A). Even when additionally combined with atmosphere inside the headlamp, therefore, the area (A) can be kept lower in temperature and prevented from becoming softened.

Fig. 6 shows another embodiment of the present invention and is an enlarged view showing a portion thereof corresponding to the portion III in Fig. 4.

The reflecting parabolic face 33 of the reflector 30 comprises applying the undercoat 34 to the inner suface of the parabolic reflector body 31 and then further applying the reflecting coat 35 on the undercoat 34. The transparent top coat 36 is also applied on the reflecting coat 35. The zone 40 where the light reducing means is arranged is also formed at the same location as that in the above-described embodiment. This light reducing means is also intended to reflect light irregularly and formed by positively providing rough and uneven portion 42 on the inner surface of said reflector body 31. When the reflector body 31 is made of metal, its surface is made rough and uneven by shot-blasting. When it is made of synthetic resin, its surface is molded rough and uneven by a molding die. The reflecting coat 35 is applied to the rough and uneven portion 42 with the undercoat 34 interposed therebetween. The undercoat 34 can not to flat and smoth the surface of the rough portion 42, because the thickness of undercoat 34 is too thin. Accordingly, the reflecting coat 35 is left rough and uneven. Light (L) of the sub-filament 55 is thus irregularly reflected by the zone 40 where the irregularly-reflecting means is provided. There-

fore, the amount of light incident from the zone 40 onto the area (A) is reduced to keep the area (A) lower in temperature, thus preventing the area (A) from becoming softened.

Figs. 7 throug 9 show a further embodiment of the present invention. Same parts as those in the above-described embodiments will be represented by same reference numerals and description on these parts will be omitted.

The light reducing means arranged at the zone 40 is intended to reflect light diffusedly in this embodiment. This diffusedly-reflecting means comprises providing a plurality of slanted faces 43 on the inner face of the reflector body 31 at such angles that enable the amount of reflected light incident onto the area (A) to be reduced. Each of slanted faces 43 is slanted downward and the reflecting ~~film~~ coat 35 is applied to these slanted faces 43 with the undercoat 34 interposed therebetween. ~~Beams radially~~ Light radiated from the sub-filament 55 are diffusedly reflected by each of slanted faces 43, as shown in Fig. 9. The absolute magnitude of light (L') reflected incident onto the area (A) is thus reduced to thereby protect the area (A) from heat.

Figs. 10 and 11 are front and sectional views showing a variation of the embodiment shown in Figs. 7 through 9. Slanted faces 44 which serve to function as the diffusedly reflecting means are formed along the vertical axis (Y). Therefore, ~~beams~~ light radiated from the sub-filament 55 are reflected diffusedly in right and left directions. As the result, the amount of light (L') reflected incident onto the area (A) can be reduced, thus protecting the area (A) from heat.

Although some preferred embodiments have been described in detail referring to the accompanying drawings, it should be understood that the present invention is not limited to these embodiments but that all modifications and variations not departing from the technical scope of the present invention are included in the present invention.

6. What is claimed is:

1. A vehicle headlamp comprising

(a) a reflector having about a reflecting parabolic face formed on the inner face of a reflector body,

(b) a lens made of synthetic resin and attached to the front end of said reflector, and

(c) a lamp having at least one filament in an glass envelope and being attached to the reflector in such a way that the filament is positioned ahead the focussing point of said reflecting face,

wherein said reflecting face comprises applying a reflecting ~~film~~ coat onto an undercoat which has been coated on the inner face of said reflector body, and includes a zone where a light reducing means is arranged to reduce the amount of light coming from the filament onto the lens at an upper area thereof.

2. A vehicle headlamp according to claim 1 wherein said zone is positioned above the lamp and along an axis vertically passing through an optical axis.

3. A vehicle headlamp according to claim 1 wherein the light reducing means arranged at the zone is intended to reflect light irregularly.

4. A vehicle headlamp according to claim 3 wherein

said irregularly reflecting means comprises applying the reflecting ~~film~~ coat directly onto the inner face of said reflector body, leaving said zone undercoatless.

5. A vehicle headlamp according to claim 3 wherein said irregularly reflecting means comprises making the inner face of said reflector body rough and uneven and then applying the reflecting ~~film~~ coat onto the rough and uneven portion with the undercoat interposed therebetween.

6. A vehicle headlamp according to claim 1 wherein said light reducing means arranged at the zone is intended to reflect light diffusedly.

7. A vehicle headlamp according to claim 6 wherein said diffusedly reflecting means comprises providing a plurality of slanted faces on the inner face of said reflector body and applying the reflecting ~~film~~ coat onto the slanted faces with the undercoat interposed therebetween.

GRÜNECKER, KINKELDEY, STOCKMAIR & PARTNER

PATENTANWÄLTE
EUROPEAN PATENT ATTORNEYS

A. GRÜNECKER, DIPL.-ING.
DR. H. KINKELDEY, DIPL.-ING.
DR. W. STOCKMAIR, DIPL.-ING. (CALTECH)
DR. K. SCHUMANN, DIPL.-PHYS.
P. H. JAKOB, DIPL.-ING.
DR. G. BEZOLD, DIPL.-CHEM.
W. MEISTER, DIPL.-ING.
H. HILGERS, DIPL.-ING.
DR. H. MEYER-PLATH, DIPL.-ING.

8000 MÜNCHEN 22
MAXIMILIANSTRASSE 58

January 26, 1984
EP 902-40

82 111 721.5
Ichikoh Ind.

AMENDED
CLAIMS

New patent claims

1. A vehicle headlamp comprising
   a) a reflector having about a reflecting parabolic face formed on the inner face of a reflector body,
   b) a lens made of synthetic resin and attached to the front end of said reflector,
   c) a lamp having at least one filament in a glass envelope and being attached to the reflector in such a way that the filament is positioned ahead the focussing point of said reflecting face, and
   d) light reducing means provided at a zone of the reflecting parabolic face to reduce the amount of light coming from the lamp,

characterized in that

   e) the light reducing means (40) are comprised of uneven surface elements (42; 43; 44) for irregularly reflecting light, and

AMENDED CLAIMS

f) the uneven surface elements are performed as rough surface portions formed at a zone (40) of the reflecting parabolic face (33).

2. A vehicle headlamp according to claim 1, characterized in that the rough surface portions are performed in the form of a plurality of slanted faces (43).

3. A vehicle headlamp according to claim 1, characterized in that said zone (40) is positioned above the lamp (50) and along an axis vertically passing through an optical axis (X).

4. A vehicle headlamp according to claim 1, characterized in that said irregularly reflecting means comprises applying the reflecting coat (35) directly onto the inner face (41) of said reflector body (30), leaving said zone (40) undercoatless.

5. A vehicle headlamp according to claim 1, characterized in that said irregularly reflecting means comprises making the inner face of said reflector body rough and uneven and then applying the reflecting coat (35) onto the rough and uneven portion with the undercoat (34) interposed therebetween.

6. A vehicle headlamp according to claim 1, characterized in that said light reducing means arranged at the zone is performed as to reflect light diffusedly.

7. A vehicle headlamp according to claim 2, characterized in that the reflecting coat (35) is applied onto the slanted faces with an undercoat (34) interposed therebetween.

FIG. 1

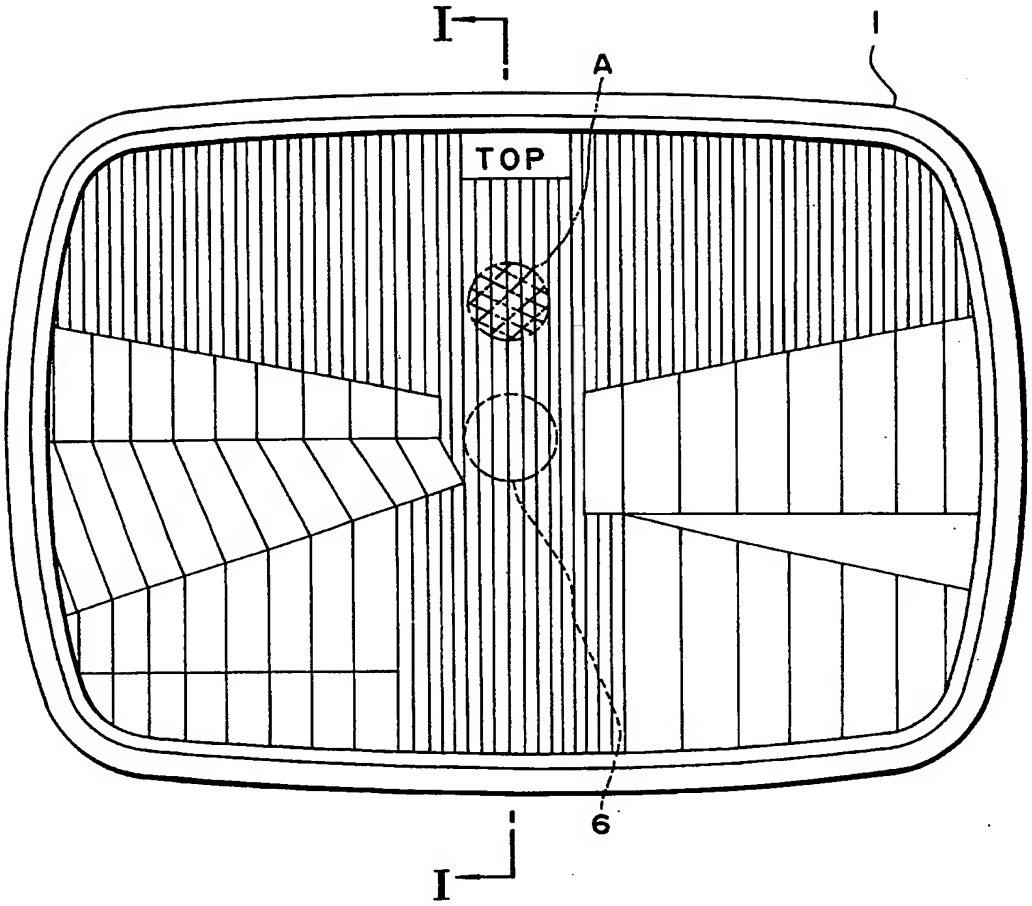


FIG. 2

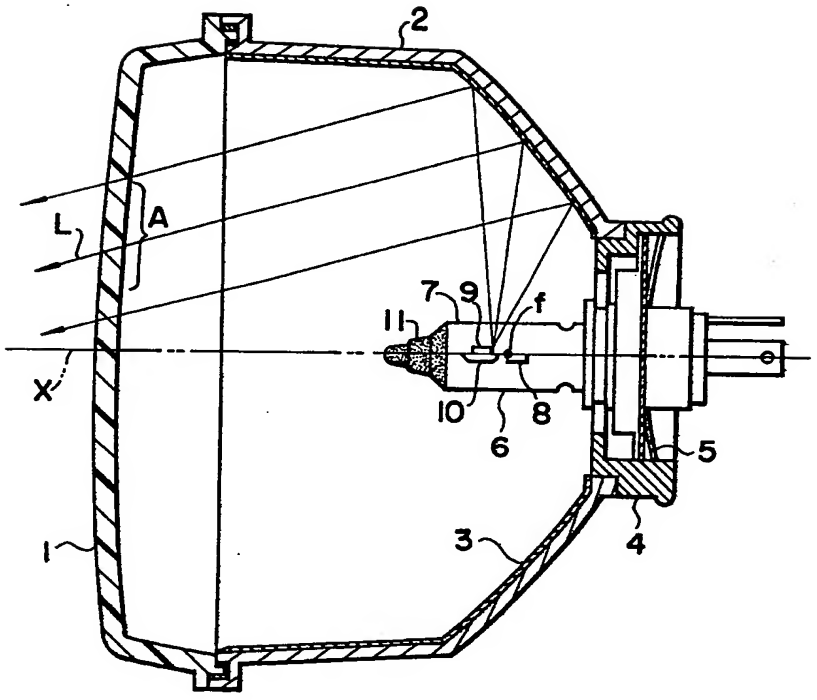


FIG. 3

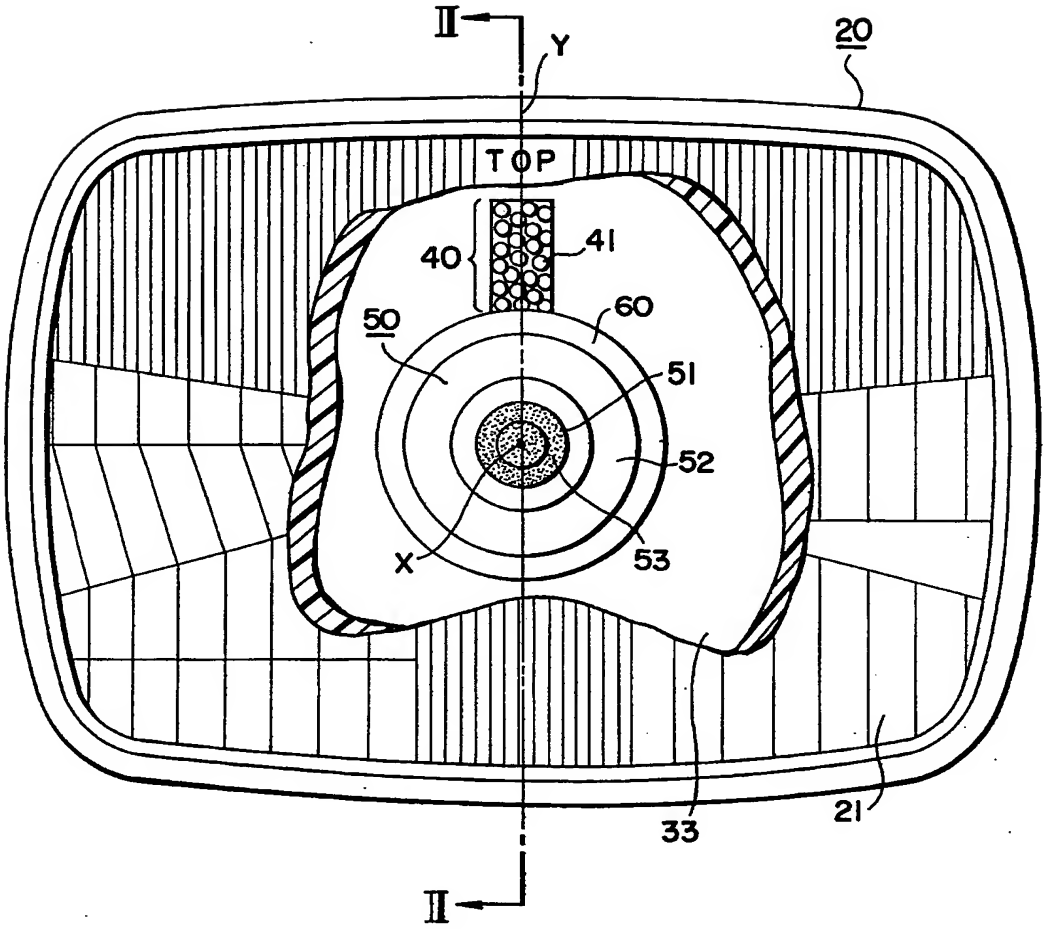


FIG. 4

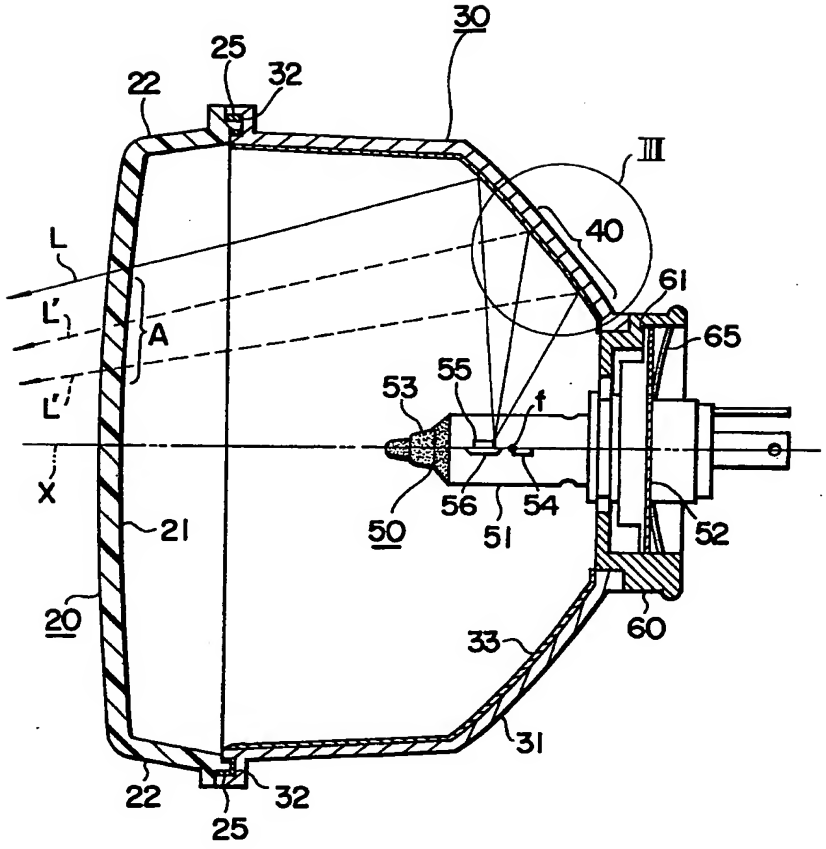


FIG. 5

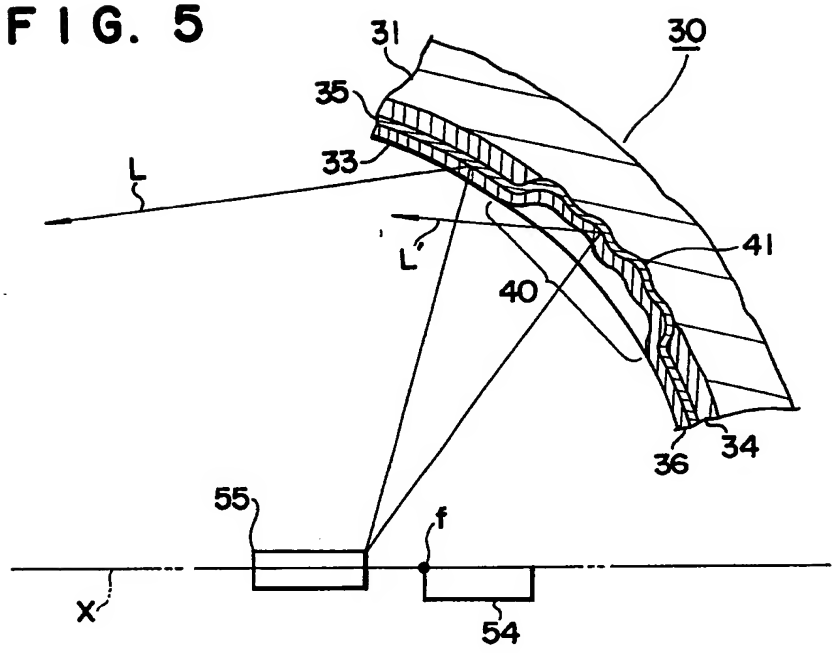


FIG. 6

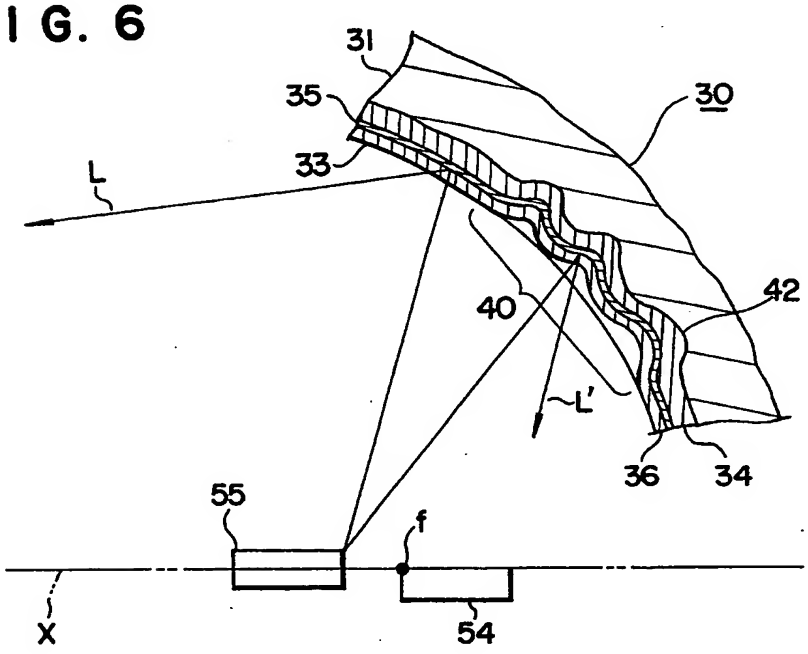


FIG. 7

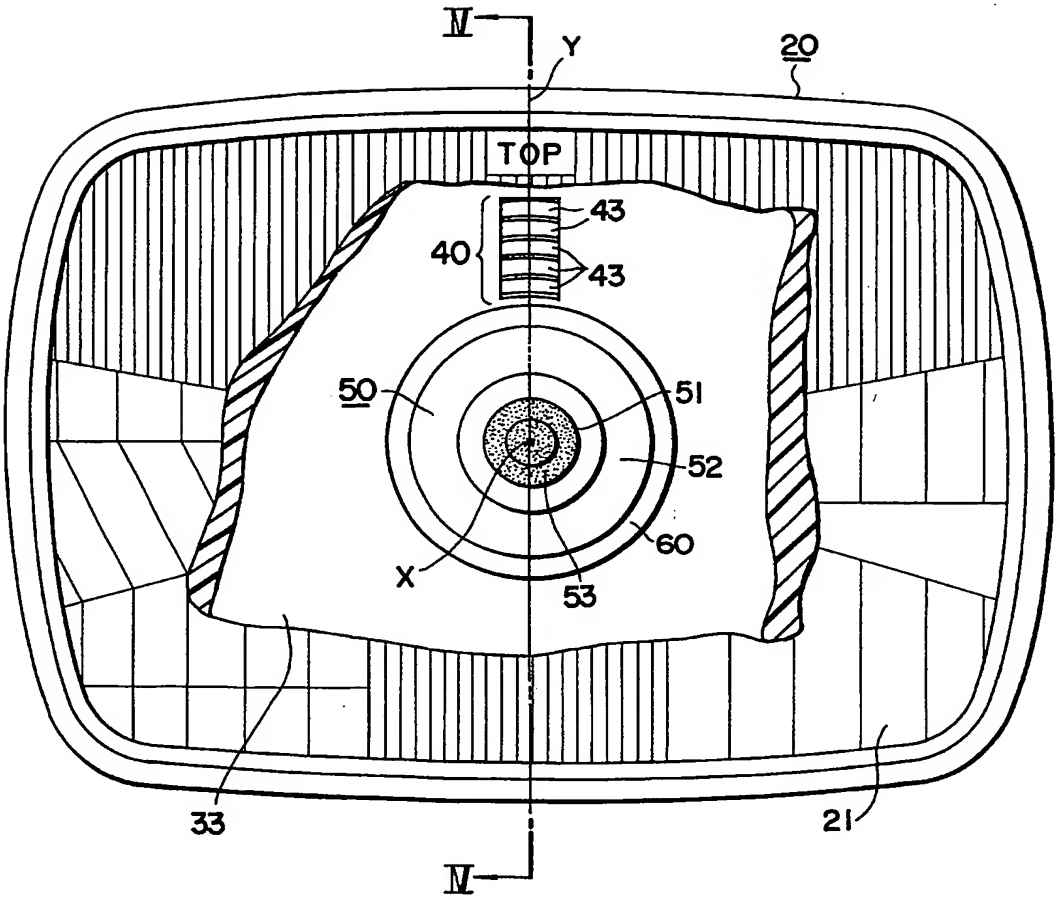
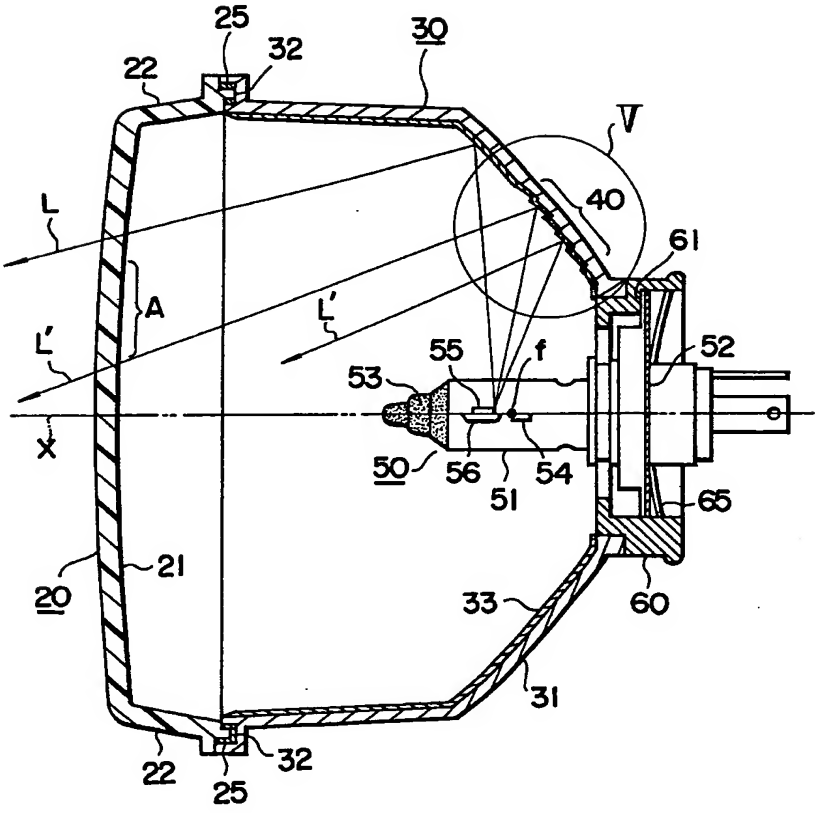


FIG. 8



8/11

FIG. 9

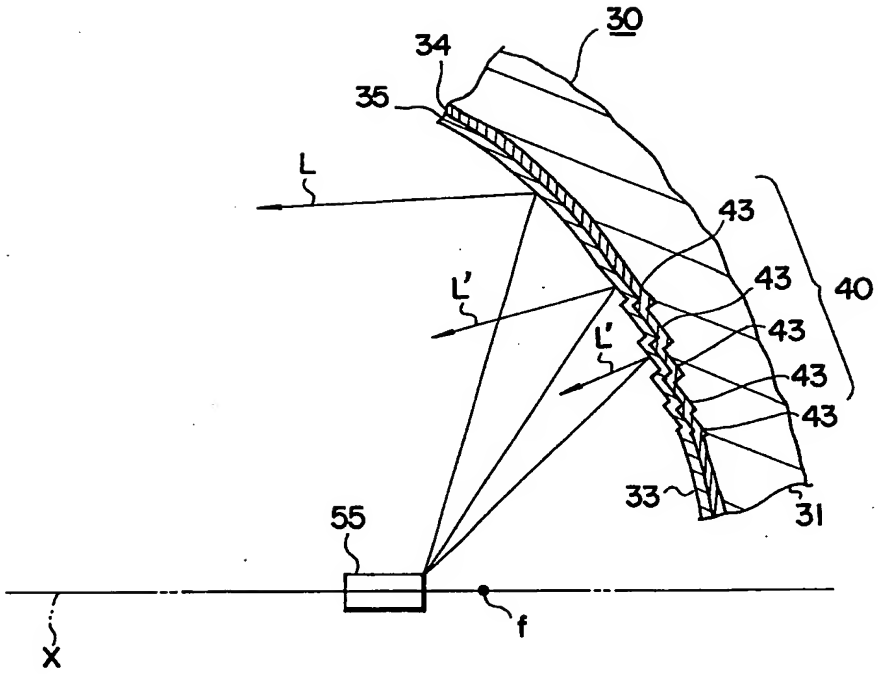


FIG. 10

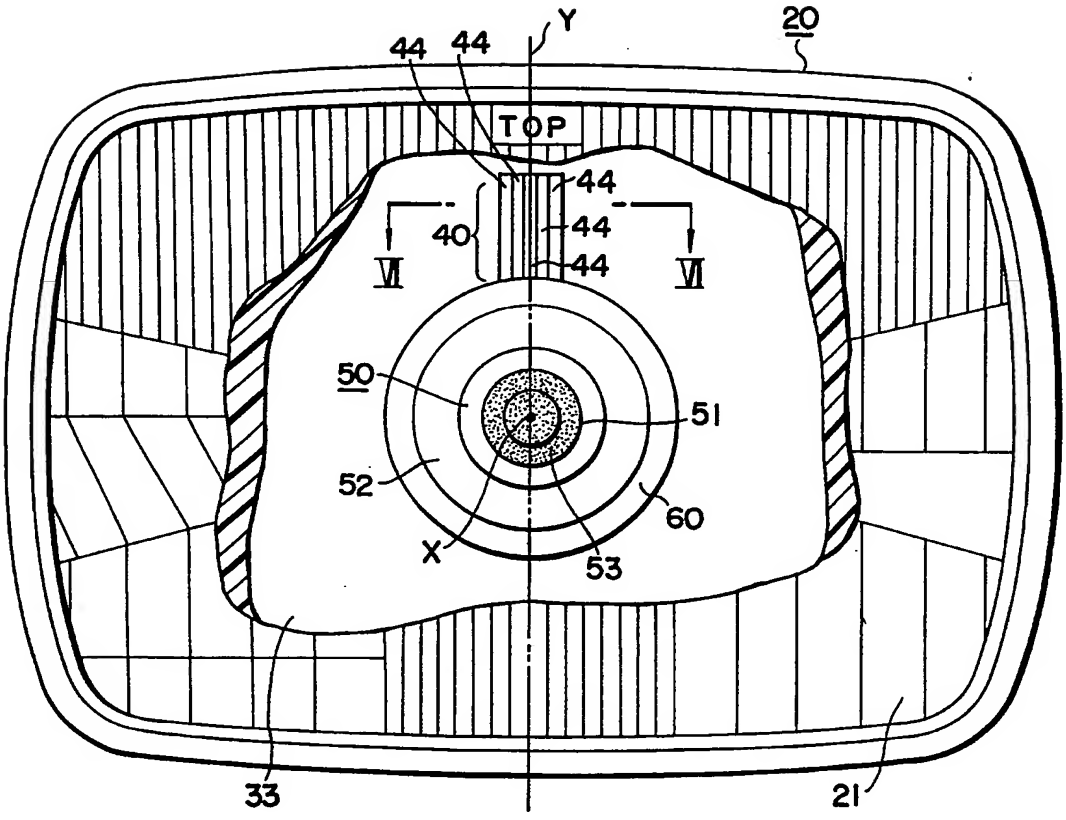
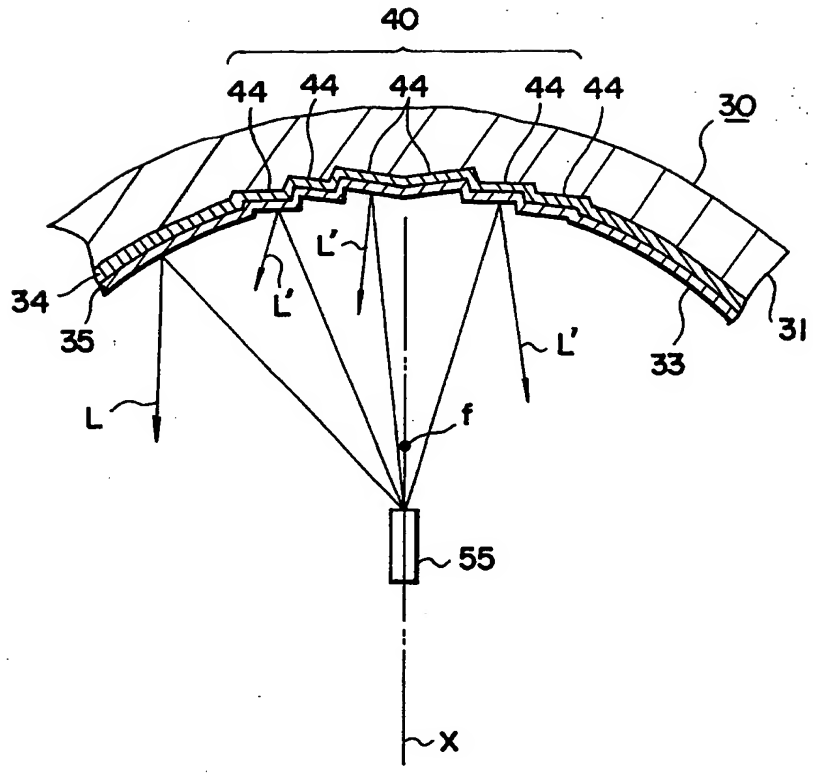


FIG. 11



European Patent Office

EUROPEAN SEARCH REPORT

Application number
EP 82 11 1721

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl. ³)
Y	GB-A-2 011 600 (CIBIE) * Page 2, lines 9-12 *	1	F 21 M 7/00 F 21 M 3/08
Y	FR-A-2 055 889 (CIBIE) * Page 1, lines 24-28 *	1	
A	US-A-1 413 315 (CORRELL) * Page 1, lines 60-63 *	3,5,6	
A	US-A-1 737 027 (SCHOONMAKER) * Figure 1 *	7	

TECHNICAL FIELDS SEARCHED (Int. Cl. ³)

F 21 M
F 21 V

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	17-08-1983	FOUCRAY R.B.F.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO Form 1503. 03.82